

# DATA SHEET

## **KMZ11B1** Magnetic field sensor

Preliminary specification  
Supersedes data of 1996 Nov 08  
File under Discrete Semiconductors, SC17

1996 Dec 11

# Magnetic field sensor

# KMZ11B1

### DESCRIPTION

The KMZ11B1 is a sensitive magnetic field sensor, employing the magnetoresistive effect of thin-film permalloy. Its properties enable this sensor to be used in a wide range of applications for current and field measurement, revolution counters, angular or linear displacement sensors, proximity detectors, etc. The sensor can be operated at any frequency between DC and 1 MHz.

### PINNING

| PIN    | SYMBOL          | DESCRIPTION    |
|--------|-----------------|----------------|
| 1      | +V <sub>O</sub> | output voltage |
| 2      | GND             | ground         |
| 3      | -V <sub>O</sub> | output voltage |
| 4      | V <sub>CC</sub> | supply voltage |
| 5 to 8 | n.c.            | not connected  |

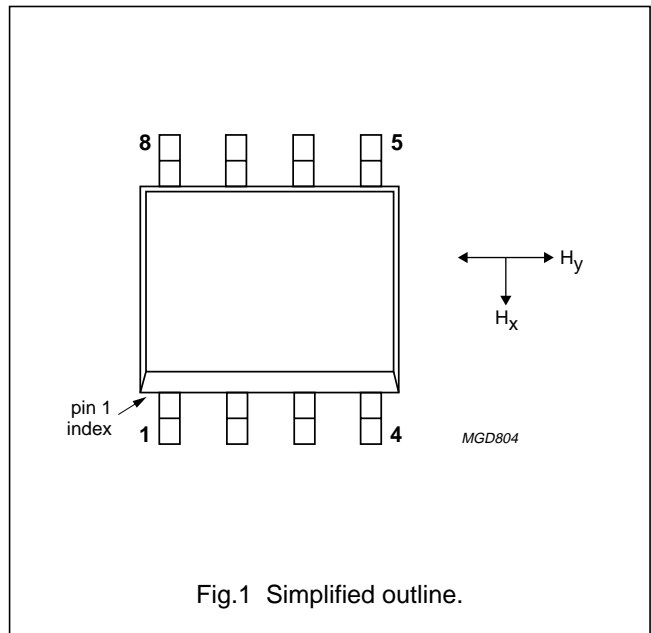


Fig.1 Simplified outline.

### QUICK REFERENCE DATA

| SYMBOL              | PARAMETER               | MIN. | TYP. | MAX. | UNIT                |
|---------------------|-------------------------|------|------|------|---------------------|
| V <sub>CC</sub>     | bridge supply voltage   | -    | 5    | -    | V                   |
| H <sub>y</sub>      | magnetic field strength | -2   | -    | +2   | kA/m                |
| H <sub>x</sub>      | auxiliary field         | -    | 3    | -    | kA/m                |
| S                   | sensitivity             | -    | 4    | -    | $\frac{mV/V}{kA/m}$ |
| R <sub>bridge</sub> | bridge resistance       | 1.9  | -    | 2.9  | kΩ                  |
| V <sub>offset</sub> | offset voltage          | -1.5 | -    | +1.5 | mV/V                |

### CIRCUIT DIAGRAM

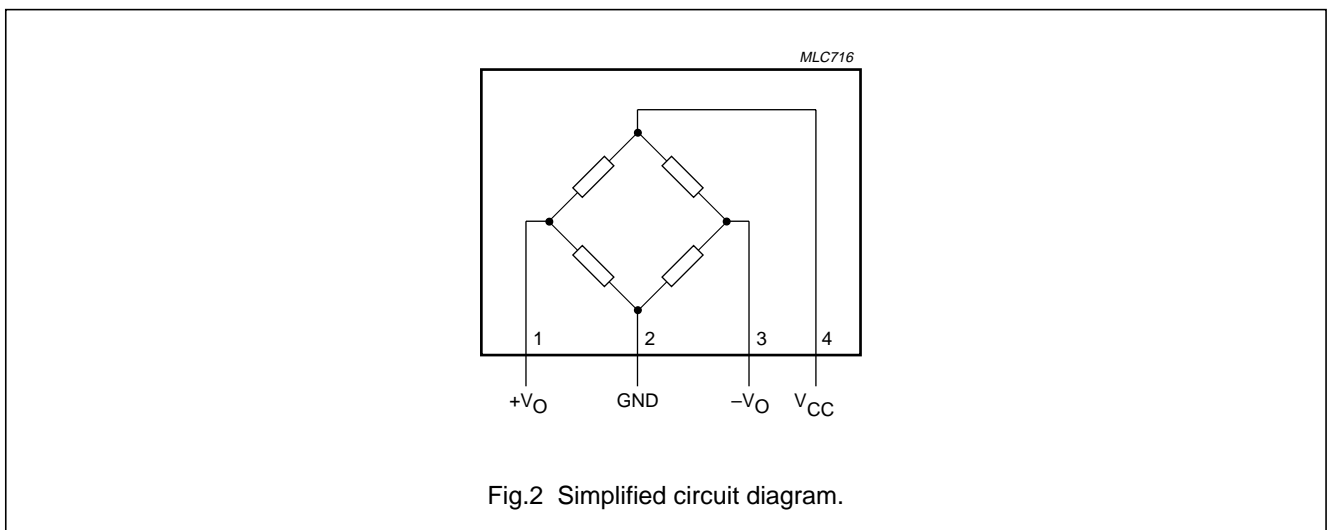


Fig.2 Simplified circuit diagram.

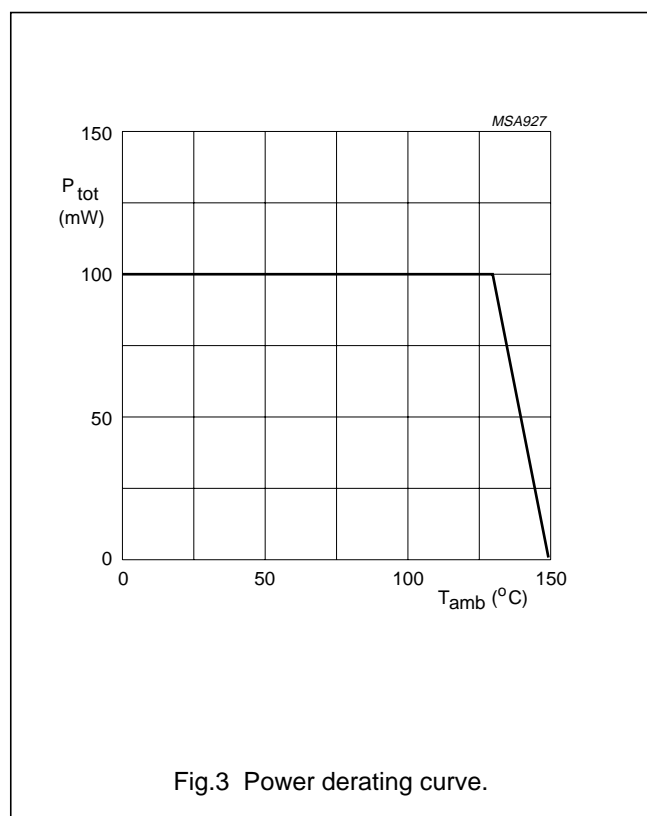
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**LIMITING VALUES**

In accordance with the Absolute Maximum Rating System (IEC 134).

| SYMBOL       | PARAMETER                    | CONDITIONS                                    | MIN. | MAX. | UNIT               |
|--------------|------------------------------|---|------|------|--------------------|
| $V_{CC}$     | bridge supply voltage        |   | –    | 12   | V                  |
| $P_{tot}$    | total power dissipation      | up to $T_{amb} = 130\text{ }^{\circ}\text{C}$ | –    | 120  | mW                 |
| $T_{stg}$    | storage temperature          |   | –65  | +150 | $^{\circ}\text{C}$ |
| $T_{bridge}$ | bridge operating temperature |   | –40  | +150 | $^{\circ}\text{C}$ |



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## THERMAL CHARACTERISTICS

| SYMBOL        | PARAMETER                                   | VALUE | UNIT |
|---------------|---|-------|------|
| $R_{th\ j-a}$ | thermal resistance from junction to ambient | 155   | K/W  |

## CHARACTERISTICS

$T_{amb} = 25\text{ °C}$ ;  $H_x = 3\text{ kA/m}$ , note 1;  $V_{CC} = 5\text{ V}$  unless otherwise specified.

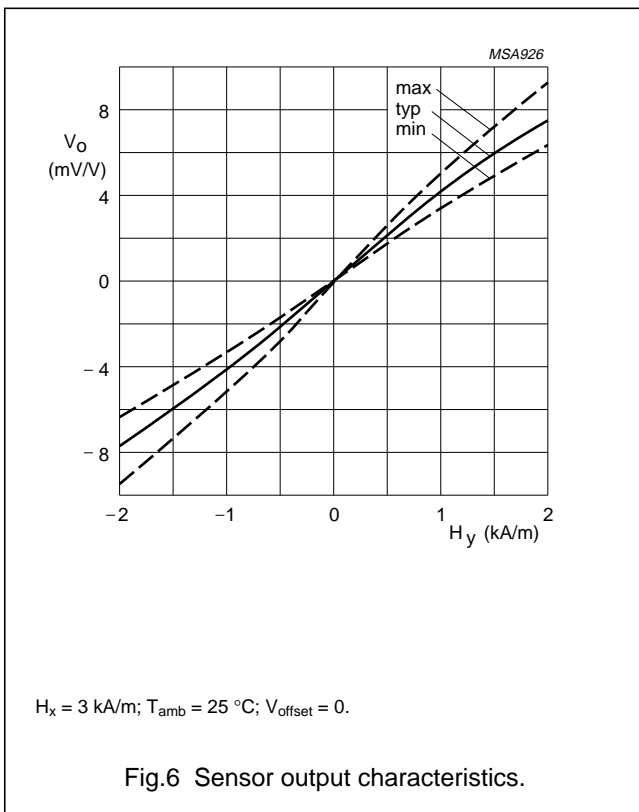
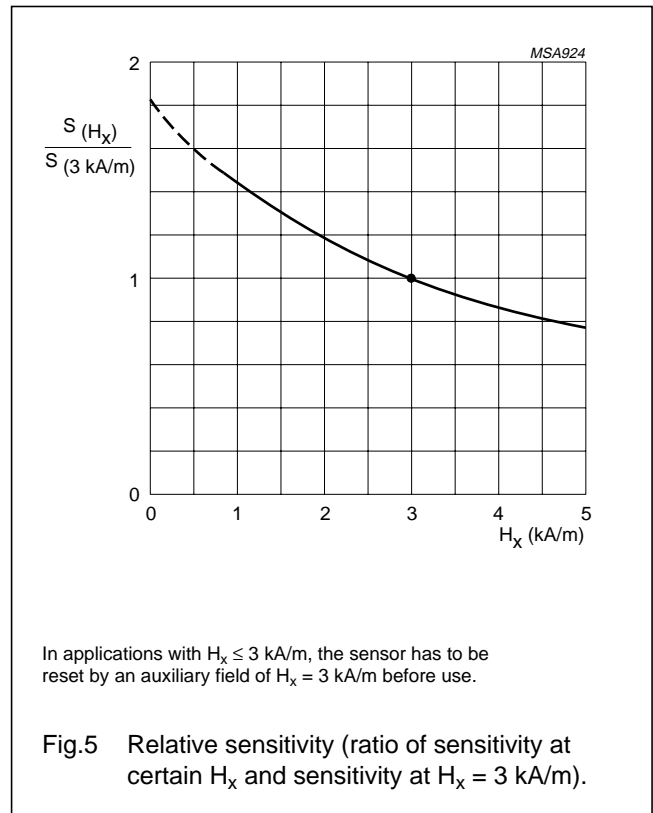
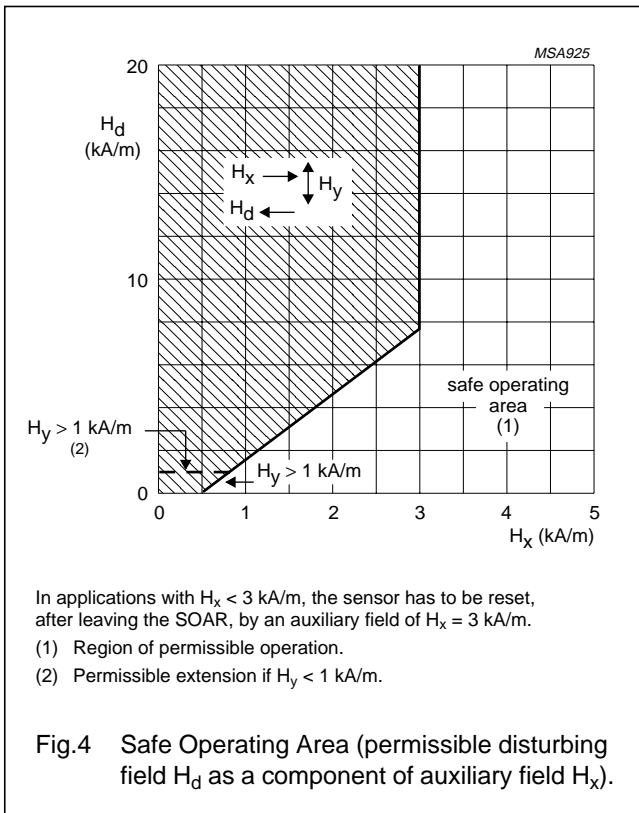
| SYMBOL         | PARAMETER                                    | CONDITIONS   | MIN. | TYP. | MAX.      | UNIT                |
|----------------|--|--|------|------|-----------|---------------------|
| $V_{CC}$       | bridge supply voltage                        |  | –    | 5    | –         | V                   |
| $H_y$          | magnetic field strength                      |  | –2   | –    | +2        | kA/m                |
| S              | sensitivity                                  | open circuit   | 3.2  | –    | 4.8       | $\frac{mV/V}{kA/m}$ |
| $TCV_O$        | temperature coefficient of output voltage    | $V_{CC} = 5\text{ V}$ ;<br>$T_{amb} = -25\text{ to }+125\text{ °C}$  | –    | –0.4 | –         | %/K                 |
|                |  | $I_{CC} = 3\text{ mA}$ ;<br>$T_{amb} = -25\text{ to }+125\text{ °C}$ | –    | –0.1 | –         | %/K                 |
| $R_{bridge}$   | bridge resistance                            |  | 1.9  | –    | 2.9       | k $\Omega$          |
| $TCR_{bridge}$ | temperature coefficient of bridge resistance | $T_{bridge} = -25\text{ to }+125\text{ °C}$                          | –    | 0.3  | –         | %/K                 |
| $V_{offset}$   | offset voltage                               |  | –1.5 | –    | +1.5      | mV/V                |
| $TCV_{offset}$ | offset voltage drift                         | $T_{bridge} = -25\text{ to }+125\text{ °C}$                          | –3   | –    | +3        | $\frac{\mu V/V}{K}$ |
| FL             | linearity deviation of output voltage        | $H_y = 0\text{ to } \pm 1\text{ kA/m}$                               | –    | –    | $\pm 0.5$ | %-FS                |
|                |  | $H_y = 0\text{ to } \pm 1.6\text{ kA/m}$                             | –    | –    | $\pm 1.7$ | %-FS                |
|                |  | $H_y = 0\text{ to } \pm 2\text{ kA/m}$                               | –    | –    | $\pm 4$   | %-FS                |
| FH             | hysteresis of output voltage                 |  | –    | –    | 1         | %-FS                |
| f              | operating frequency                          |  | 0    | –    | 1         | MHz                 |

## Note

- In applications with  $H_x < 3\text{ kA/m}$  the sensor has to be reset before first operation by application of an auxiliary field  $H_x = 3\text{ kA/m}$ .

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APPLICATION INFORMATION

The leadframe material is a copper alloy containing 2% iron. In applications with magnetic fields outside the specified operating range an increasing hysteresis effect will arise due to magnetization effects in the leadframe. However, in angular measurement applications of the KMZ11B1 in combination with strong magnetic fields  $H > 50$  kA/m there is no additional hysteresis present.

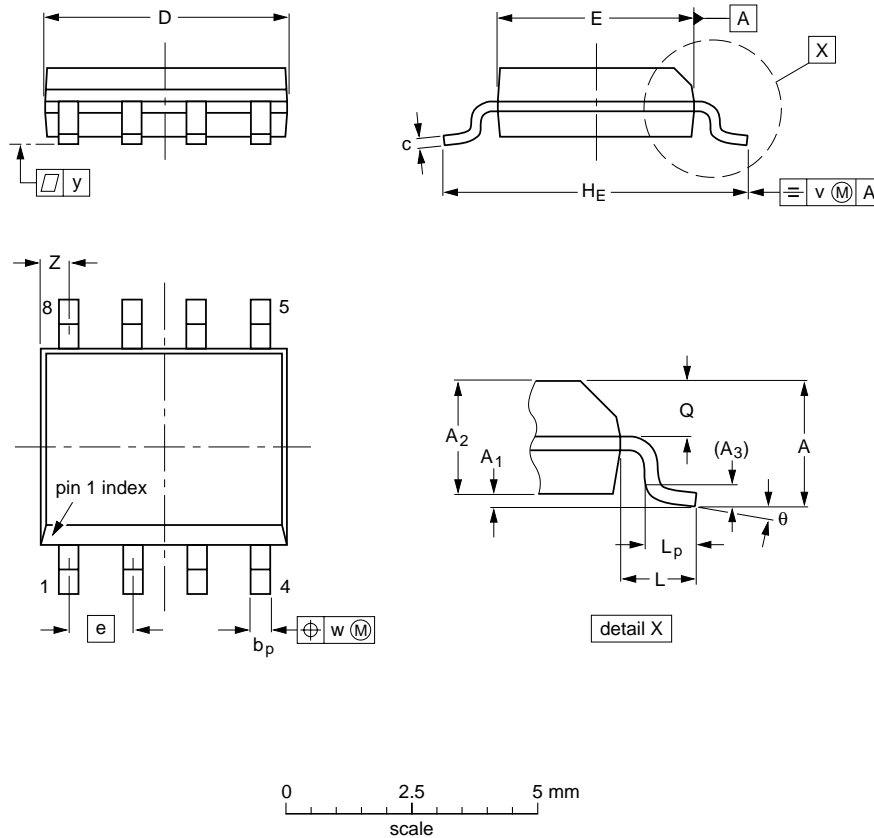
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PACKAGE OUTLINE

SO8: plastic small outline package; 8 leads; body width 3.9 mm

SOT96-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT   | A max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c                | D <sup>(1)</sup> | E <sup>(2)</sup> | e     | H <sub>E</sub> | L     | L <sub>p</sub> | Q              | v    | w    | y     | Z <sup>(1)</sup> | θ        |
|--------|--------|----------------|----------------|----------------|----------------|------------------|------------------|------------------|-------|----------------|-------|----------------|----------------|------|------|-------|------------------|----------|
| mm     | 1.75   | 0.25<br>0.10   | 1.45<br>1.25   | 0.25           | 0.49<br>0.36   | 0.25<br>0.19     | 5.0<br>4.8       | 4.0<br>3.8       | 1.27  | 6.2<br>5.8     | 1.05  | 1.0<br>0.4     | 0.7<br>0.6     | 0.25 | 0.25 | 0.1   | 0.7<br>0.3       | 8°<br>0° |
| inches | 0.069  | 0.010<br>0.004 | 0.057<br>0.049 | 0.01           | 0.019<br>0.014 | 0.0100<br>0.0075 | 0.20<br>0.19     | 0.16<br>0.15     | 0.050 | 0.244<br>0.228 | 0.041 | 0.039<br>0.016 | 0.028<br>0.024 | 0.01 | 0.01 | 0.004 | 0.028<br>0.012   |          |

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES |          |      |  | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|----------|------|--|---------------------|----------------------|
|                 | IEC        | JEDEC    | EIAJ |  |                     |                      |
| SOT96-1         | 076E03S    | MS-012AA |      |  |                     | 95-02-04<br>97-05-22 |

## Magnetic field sensor

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**DEFINITIONS**

| <b>Data Sheet Status</b>  |   |
|---|---|
| Objective specification   | This data sheet contains target or goal specifications for product development.       |
| Preliminary specification   | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification   | This data sheet contains final product specifications.                                |
| <b>Limiting values</b>  |   |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. |   |
| <b>Application information</b>  |   |
| Where application information is given, it is advisory and does not form part of the specification.   |   |

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# Philips Semiconductors – a worldwide company

**Argentina:** see South America

**Australia:** 34 Waterloo Road, NORTH RYDE, NSW 2113,  
Tel. +61 2 9805 4455, Fax. +61 2 9805 4466

**Austria:** Computerstr. 6, A-1101 WIEN, P.O. Box 213,  
Tel. +43 1 60 101, Fax. +43 1 60 101 1210

**Belarus:** Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6,  
220050 MINSK, Tel. +375 172 200 733, Fax. +375 172 200 773

**Belgium:** see The Netherlands

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**Bulgaria:** Philips Bulgaria Ltd., Energoproject, 15th floor,  
51 James Bourchier Blvd., 1407 SOFIA,  
Tel. +359 2 689 211, Fax. +359 2 689 102

**Canada:** PHILIPS SEMICONDUCTORS/COMPONENTS,  
Tel. +1 800 234 7381

**China/Hong Kong:** 501 Hong Kong Industrial Technology Centre,  
72 Tat Chee Avenue, Kowloon Tong, HONG KONG,  
Tel. +852 2319 7888, Fax. +852 2319 7700

**Colombia:** see South America

**Czech Republic:** see Austria

**Denmark:** Prags Boulevard 80, PB 1919, DK-2300 COPENHAGEN S,  
Tel. +45 32 88 2636, Fax. +45 31 57 1949

**Finland:** Sinikalliontie 3, FIN-02630 ESPOO,  
Tel. +358 9 615800, Fax. +358 9 61580/xxx

**France:** 4 Rue du Port-aux-Vins, BP317, 92156 SURESNES Cedex,  
Tel. +33 1 40 99 6161, Fax. +33 1 40 99 6427

**Germany:** Hammerbrookstraße 69, D-20097 HAMBURG,  
Tel. +49 40 23 53 60, Fax. +49 40 23 536 300

**Greece:** No. 15, 25th March Street, GR 17778 TAVROS/ATHENS,  
Tel. +30 1 4894 339/239, Fax. +30 1 4814 240

**Hungary:** see Austria

**India:** Philips INDIA Ltd, Shivsagar Estate, A Block, Dr. Annie Besant Rd.  
Worli, MUMBAI 400 018, Tel. +91 22 4938 541, Fax. +91 22 4938 722

**Indonesia:** see Singapore

**Ireland:** Newstead, Clonskeagh, DUBLIN 14,  
Tel. +353 1 7640 000, Fax. +353 1 7640 200

**Israel:** RAPAC Electronics, 7 Kehilat Saloniki St, TEL AVIV 61180,  
Tel. +972 3 645 0444, Fax. +972 3 649 1007

**Italy:** PHILIPS SEMICONDUCTORS, Piazza IV Novembre 3,  
20124 MILANO, Tel. +39 2 6752 2531, Fax. +39 2 6752 2557

**Japan:** Philips Bldg 13-37, Kohnan 2-chome, Minato-ku, TOKYO 108,  
Tel. +81 3 3740 5130, Fax. +81 3 3740 5077

**Korea:** Philips House, 260-199 Itaewon-dong, Yongsan-ku, SEOUL,  
Tel. +82 2 709 1412, Fax. +82 2 709 1415

**Malaysia:** No. 76 Jalan Universiti, 46200 PETALING JAYA, SELANGOR,  
Tel. +60 3 750 5214, Fax. +60 3 757 4880

**Mexico:** 5900 Gateway East, Suite 200, EL PASO, TEXAS 79905,  
Tel. +9-5 800 234 7381

**Middle East:** see Italy

**Netherlands:** Postbus 90050, 5600 PB EINDHOVEN, Bldg. VB,  
Tel. +31 40 27 82785, Fax. +31 40 27 88399

**New Zealand:** 2 Wagener Place, C.P.O. Box 1041, AUCKLAND,  
Tel. +64 9 849 4160, Fax. +64 9 849 7811

**Norway:** Box 1, Manglerud 0612, OSLO,  
Tel. +47 22 74 8000, Fax. +47 22 74 8341

**Philippines:** Philips Semiconductors Philippines Inc.,  
106 Valero St. Salcedo Village, P.O. Box 2108 MCC, MAKATI,  
Metro MANILA, Tel. +63 2 816 6380, Fax. +63 2 817 3474

**Poland:** Ul. Lukiska 10, PL 04-123 WARSZAWA,  
Tel. +48 22 612 2831, Fax. +48 22 612 2327

**Portugal:** see Spain

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**Russia:** Philips Russia, Ul. Usatcheva 35A, 119048 MOSCOW,  
Tel. +7 095 247 9145, Fax. +7 095 247 9144

**Singapore:** Lorong 1, Toa Payoh, SINGAPORE 1231,  
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2092 JOHANNESBURG, P.O. Box 7430 Johannesburg 2000,  
Tel. +27 11 470 5911, Fax. +27 11 470 5494

**South America:** Rua do Rocio 220, 5th floor, Suite 51,  
04552-903 São Paulo, SÃO PAULO - SP, Brazil,  
Tel. +55 11 821 2333, Fax. +55 11 829 1849

**Spain:** Balmes 22, 08007 BARCELONA,  
Tel. +34 3 301 6312, Fax. +34 3 301 4107

**Sweden:** Kottbygatan 7, Akalla, S-16485 STOCKHOLM,  
Tel. +46 8 632 2000, Fax. +46 8 632 2745

**Switzerland:** Allmendstrasse 140, CH-8027 ZÜRICH,  
Tel. +41 1 488 2686, Fax. +41 1 481 7730

**Taiwan:** PHILIPS TAIWAN Ltd., 23-30F, 66,  
Chung Hsiao West Road, Sec. 1, P.O. Box 22978,  
TAIPEI 100, Tel. +886 2 382 4443, Fax. +886 2 382 4444

**Thailand:** PHILIPS ELECTRONICS (THAILAND) Ltd.,  
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**Turkey:** Talatpasa Cad. No. 5, 80640 GÜLTEPE/ISTANBUL,  
Tel. +90 212 279 2770, Fax. +90 212 282 6707

**Ukraine:** PHILIPS UKRAINE, 4 Patrice Lumumba str., Building B, Floor 7,  
252042 KIEV, Tel. +380 44 264 2776, Fax. +380 44 268 0461

**United Kingdom:** Philips Semiconductors Ltd., 276 Bath Road, Hayes,  
MIDDLESEX UB3 5BX, Tel. +44 181 730 5000, Fax. +44 181 754 8421

**United States:** 811 East Arques Avenue, SUNNYVALE, CA 94088-3409,  
Tel. +1 800 234 7381

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Tel. +381 11 625 344, Fax. +381 11 635 777

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